REMARKS

This paper is responsive to a Final Office Action dated January 6, 2004. Prior to this amendment claims 1-8, 12, and 20-22 were pending. After amending claims 1-4, 8, 20, and 22, and adding new claims 23-25, claims 1-8, 12, and 20-25 remain pending.

Section 1 of the Office Action states that claims 1-4, 7, 12, and 21 have been rejected under 35 U.S.C. 102(e) as being anticipated by Yamazaki et al. ("Yamazaki"; US Pub 2003/0207502). With respect to claim 1, the Office Action states that Yamazaki discloses the steps of a PVD process to deposit amorphous silicon on a substrate, introducing a metal catalyst, annealing, and forming a pure metal-induced crystallization region. The Office Action also states that Yamazaki discloses the following: with respect to claim 2, an excimer laser process; with respect to claim 3, a thin film transistor product; with respect to claim 4, an LCD crystallized region; with respect to claim 7, annealing particulars; with respect to claim 12, a barrier layer; with respect to claim 21, metal catalysts. This rejection is traversed as follows.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Generally, Yamazaki is concerned with fabricating a TFT, for use in an LCD, with the same reliability as MOSFETs (0008). Two of the three reasons supporting the greater MOSFET reliability involve impurity concentrations (0009-0010). Paragraph 0105 begins an explanation of a

first invention embodiment. Yamazaki discloses a sputtering process of depositing amorphous silicon, and a process of introducing a catalyst such as Ni (0107-0109). Then, a polysilicon film is formed as a result of an annealing process (0110). Similar process steps are described in paragraphs 0156-0157.

Claim 1 has been amended to recite the step of suppressing partial solid phase crystallization (SPC) that occurs with conventional processes, such as Yamazaki's, in parallel with the metal-induced crystallization (MIC) process. Yamazaki does not describe a MIC process that simultaneously suppresses SPC. In fact, Yamazaki does even discuss the issue of SPC. Alternately stated, Yamazaki does not describe the quality of the polysilicon film he fabricates, other than to say that it has "outstanding crystalline characteristics" (0110). The invention of claim 1 recites a MIC process that does not produce areas of SPC in the MIC film.

The ability of the claimed invention process to suppress SPC is recited as process specifics that are further developed in the dependent claims. The claimed invention process uses a higher annealing temperature than Yamazaki (greater than 650 degrees C – claim 7), an Argon sputtering gas (claim 5), and the annealing process that entirely consumes the metal catalyst (claim 25). Yamazaki uses an annealing temperature of 500 to 650 degrees C, and acknowledges that some Ni remains in the crystallized film after annealing (0110-0111).

The invention of claim 1 recites the step of suppression partial SPC in response to the annealing. Yamazaki does not describe this step. Since Yamazaki does not describe all the elements of the invention of claim 1, claim 1 is not anticipated. Claims 2-4, 7, 12, and 21,

dependent from claim 1, enjoy the same distinctions from the prior art, and the Applicant respectfully requests that the rejection be removed.

Section 2 of the Office Action states that claim 22 is rejected under 35 U.S.C. 102(e) with respect to Yamazaki. The Office Action states that Yamazaki discloses a sputtering process to deposit amorphous silicon on a substrate, introducing a metal catalyst to selected regions, annealing, and forming metal-induced crystallization in the selected region. This rejection is traversed as follows.

Claim 22, as amended, recites the steps of metal-induced crystallizing a selected region of the amorphous silicon film, while simultaneously suppressing partial SPC in the selected region. As noted in the response to the anticipation rejection presented in Section 1 of the Office Action, Yamazaki does not address the issue of SPC. Neither does Yamazaki describe any modification to an MIC process that suppresses SPC. Alternately stated, Yamazaki does not explicitly or implicitly describe a step of suppressing SPC. Since Yamazaki does not describe all the elements of claim 22, he cannot anticipate the invention of claim 22, and the Applicant requests that the rejection be removed.

Section 3 of the Office Action states that claims 5, 6, and 8 have been rejected under 35 U.S.C. 103(a) as unpatentable with respect to Yamazaki in view of Venkatesan et al. (US 5,371,382). The Office Action acknowledges that Yamazaki does not disclose the use of an Argon sputtering gas. However, the Office Action states that Venkatesan describes an amorphous Si sputtering process that uses Argon, and that it would have been obvious to combine the teaching of Yamazaki and Venkatesan to make the claimed invention obvious. The Office Action further states that the ranges of Argon content and growth front length

have not been noted in the specification as being critical. This rejection is traversed as follows.

An invention is unpatentable if the differences between it and the prior art would have been obvious at the time of the invention. As stated in MPEP § 2143, there are three requirements to establish a *prima facie* case of obviousness.

> First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re Vaeck* 947 F.2d 488, 20 USPQ2d, 1438 (Fed. Cir. 1991).

In accordance with the above-stated first *prima facie* requirement, the reference itself must suggest a reason to modify a reference, or the knowledge generally available must provide a motivation to modify the reference in such a way as to make the claimed invention obvious. Venkatesan describes the formation of amorphous Si overlying a diamond substrate (col. 2, ln. 17-31). He is concerned with developing a Si contact to the diamond semiconductor material that is able to withstand 400-degree operating temperatures (col. 1, ln. 48 through col. 2, ln. 10). More specifically, Venkatesan describes a process to deposit either B-doped or As-doped amorphous Si. This type of doping makes the amorphous silicon a conductor, as opposed to the semiconductor material needed to fabricate transistor channel regions (col. 2, ln. 55-62).

As mentioned above in the response to rejection in Section 1 of the Office Action, Yamazaki is primarily concerned with impurities in the various transistor elements. Venkatesan is concerned with fabricating an amorphous silicon conductor that would have no use in the thin film transistor being fabricated by Yamazaki. Alternately stated, it cannot be determined from the Venkatesan reference if Argon can be used to deposit semiconductor (non-heavily doped) silicon. Further, Venkatesan crystallization process does not suffer from the annealing limitations (maximum 700 degree temperature) associated with the use of Yamazaki's glass (as opposed to a diamond) substrate. Again, it cannot be determined if Venkatesan's Argon processes are applicable to relatively low-temperature glass substrate annealing processes.

"It is *prima facie* obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose.... [T]he idea of combining them flows logically from their having been individually taught in the prior art." *In re Kerkhoven*, 626 F.2d 846, 850, 205 USPQ 1069, 1072 (CCPA 1980). MPEP 2144.06. However, the Yamazaki and Venkatesan processes have different purposes and they cannot be combined for the purpose of obviousness analysis.

Further, the Office Action has not demonstrated that the modification of the cited the prior art reference points to the reasonable expectation of success in the present invention, which is the second requirement of the obviousness analysis. That is, neither Yamazaki nor Venkatesan describe a process or modification that is likely to result in the suppression of partial SPC in a MIC process film.

The third requirement to support a *prima facie* case of obviousness requires that the references disclose all the elements of the claimed invention. As noted above in response to the anticipation rejection, Yamazaki does not describe a process that suppresses SPC in response to annealing. Neither does Venkatesan describe an SPC suppression process. Therefore, the combination of references does not describe all the elements of the invention of claim 1.

The Yamazaki and Venkatesan references neither explicitly describe all the elements of claim 1, nor suggest modifications that make the invention of claim 1 obvious. Claims 5, 6, and 8, dependent from claim 1, enjoy the same distinctions from the cited prior art, and the Applicant requests that the rejection be removed.

Although the inventions of claims 5, 6, and 8 can be distinguished from the prior art on the basis of the independent claim (claim 1), the Applicant respectfully notes that the criticality of the growth front length is explored in detail in the specification at pages 11 through 18 in the explanation of Fig. 3. In summary, the specification notes that a growth front length of 80 microns, or greater, entirely consumes the metal catalyst in the crystallized Si. Yamazaki's annealing process leaves Ni in the crystallized film (0111). The claimed invention specification describes one of the process goals being the elimination of the catalyst in the annealing process.

The criticality of the Argon gas concentration is discussed in pages 18 through 20 of the claimed invention specification. Generally, the use of Argon gas is found to suppress SPC by "one to two order of magnitude" (page 19, ln. 17-19). The details of the optimal Argon

concentrations are presented in the explanation of Figs. 4-6. The claimed invention Argon concentrations are specifically tailored to suppress SPC.

Section 5 of the Office Action states that claim 20 has been rejected under 35 U.S.C. 103(a) as unpatentable with respect to Yamazaki. Yamazaki discloses the steps of a PVD process to deposit amorphous silicon on a substrate, introducing a metal catalyst, annealing, and forming a pure metal-induced crystallization region. The Office Action acknowledges that Yamazaki does not describe an annealing step of less than 800 seconds, but states that there is no evidence that the temperatures and time durations are critical. This rejection is traversed as follows.

In accordance with the above-stated first *prima facie* requirement, the reference itself must suggest a reason to modify a reference, or the knowledge generally available must provide a motivation to modify the reference in such a way as to make the claimed invention obvious. The Background Section of the instant application explains in great detail the trade-off that exists in convention crystallization processes, between unintended SPC and long lateral growth length (page 2 through 4). To summarize, SPC occurs at relatively high temperatures and/or long crystallization times (page 3, ln. 21-23). These crystallization temperatures and time frames fall squarely within the desired ranges of conventional MIC processes (page 3, ln. 21 through page 4, ln. 4). The Background Section cites the need for a higher temperature process that will speed throughput, without causing SPC. In pages 11-18 of the instant application, several examples are present of successful and unsuccessful annealing results at a variety of temperatures and time durations. More specifically, the critical need for an annealing

temperature of greater than 650 degrees C, and a time duration of less than 800 seconds is described. Further, an example process is presented that meets these goals, without damaging an underlying glass substrate.

Yamazaki does not describe any process steps that address the occurrence of SPC in the Si crystallized using his MIC process. In fact, Yamazaki appears to use the conventional, low temperature, process described in the Background Section of the instant application. There is discussion by Yamazaki of SPC issues and, therefore, no motive in the Yamazaki reference to modify his process in such as way as to address or fix the SPC problem associated with conventional MIC processes.

Alternately stated, the criticality of the process temperatures and time durations were described in the instant application Background and Detailed Description Section example processes. The claimed invention describes an annealing process that uses a higher than conventional temperature, and a shorter than conventional time duration. There is no hint of a MIC modification in the Yamazaki disclosure that addresses the higher temperatures and shorter time durations recited in the claimed invention. Thus, there is no motivation to modify Yamazaki in such a way as to make the claimed invention obvious.

Again, the Office Action fails to note any suggestion in the prior art reference that points to the reasonable expectation of success in the present invention, which is the second requirement of the obviousness analysis.

The third requirement to support a *prima facie* case of obviousness requires that the reference discloses all the elements of the claimed invention. As noted above, Yamazaki does not describe a process step that suppresses SPC, as recited in claim 20 (as amended). Further,

the claimed invention recites a higher annealing temperature and shorter time duration. As discussed above, the critical nature of the process times and durations are explored in detail in the specification in pages 11-18. Since Yamazaki neither explicitly describes, nor suggests modifications that would make the claimed invention obvious, the Applicant requests that the rejection be removed.

It is believed that the application is in condition for allowance and reconsideration is earnestly solicited.

Respectfully submitted,

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